

various parts of dynamical astronomy had to be undertaken. His efforts were unremitting to improve at every point the processes of calculation, as well as the materials on which the calculations were based. Among the greatest of Newcomb's labours, measured by their value to science, are, undoubtedly, those done in connection with this office. Astronomers all over the world recognise "The Astronomical Papers of the American Ephemeris" brought out under Newcomb's guidance as works of classical value. In this great task he had the good fortune to obtain the assistance of many eminent men, among whom was Mr. George W. Hill, who, in Newcomb's generous words, "will easily rank as the greatest master of mathematical astronomy during the last quarter of the nineteenth century." Newcomb's important "Compendium of Spherical Astronomy," published in 1906, should also be mentioned in connection with the "Astronomical Papers." After his term of service in the office of the American Ephemeris had expired in 1883 by the age-limit, Newcomb became professor of mathematics and astronomy in Johns Hopkins University in Baltimore, and this post he held until 1893.

As in the case of other men who have risen to a foremost position in science, Newcomb was wonderfully versatile. He was, as we have seen, a leader among mathematical astronomers, he did good work on various occasions in practical observation, and that he was a skilful experimenter when occasion required is shown by his beautiful investigations of the velocity of light; but Newcomb also wrote a number of books intended more for the general public than for technical astronomers. His "Popular Astronomy" is universally recognised as an admirable work full of lofty thought and luminous suggestion. It is remarkable for its literary grace no less than for its scientific accuracy, and those who had the privilege of enjoying Prof. Newcomb's friendship will recognise throughout "Popular Astronomy" indications of that quaint humour which was so characteristic of the author. He wrote many other books; he was recognised as an authority on economics and life assurance, and he even wrote a novel, though I do not know whether this particular venture was sufficiently successful to encourage a repetition of the experiment. All the honours which his own country or other countries could bestow on a man of science were liberally showered on him with universal approval.

It need hardly be said that for a self-taught man to become one of the most consummate mathematicians of his day, and one of the great leaders of science, not only great abilities, but indomitable industry were necessary. Newcomb was an indefatigable worker. From morning until night he was at his desk, and yet such was the kindness of the man that when a demand on his time and friendship was made by a brother astronomer or mathematician, his books were laid aside, and he would devote himself assiduously to a day of gracious offices for his visitor. Newcomb had a serious illness about fifteen years ago, but he made a remarkable recovery, and until the last few months he was still hard at work. He died after a long illness on July 11, 1909.

Thus passes from the world the most conspicuous figure among the brilliant band of contemporary American astronomers. His inspiring example will long be treasured by those who were acquainted with his work. His habitual loftiness of thought, nobility of character, dignified courtesy, and ever-ready helpfulness endeared him to his many friends on both sides of the Atlantic. His private acts of quiet kindness and goodness of heart will be affectionately cherished by those fortunate persons to whom they are known.

ROBERT S. BALL.

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NOTES.

THE first attempt to cross the Channel by aeroplane was made by M. Latham on Monday, July 19. The machine, which is a monoplane, started from Sangatte, and was about 600 feet above sea-level when it left the land. This altitude was increased to about 1000 feet, and a speed of between forty and forty-five miles an hour was attained. After travelling about eight miles from the shore in the direction toward Dover the engine stopped, and the monoplane glided steadily down in a straight line to the water, where it floated until the destroyer *Harpon* came up about five minutes later. M. Latham was then taken on board, and his monoplane towed into Calais harbour.

THE death is announced of M. Henri de Parville, who was for several years editor of *La Nature*, and more recently a contributor to *Cosmos*. M. de Parville did much useful work in the direction of instructing and interesting the French public in the achievements of science. Primarily an engineer, he was well versed in other branches of pure and applied science, and for many years devoted the greater part of his energies to work for the scientific Press.

THE Institute of Metals has just completed the first year of its existence, during which period the membership has increased from barely two hundred to well over five hundred. The autumn meeting of the association will be held at Manchester on Thursday and Friday, October 14 and 15. A series of about half a dozen papers will be read and discussed at the two morning sessions of the institute. The afternoon of the first day will be devoted to a visit to the University of Manchester, where members will be received officially, on behalf of the University, by Vice-Chancellor Alfred Hopkinson, K.C. The new engineering laboratories will be open for inspection, and facilities will also be given for inspecting the Municipal School of Technology. In the evening a reception will be held by the Lord Mayor at the Town Hall. During the afternoon of Friday, October 15, members will have the opportunity of visiting works of metallurgical interest in the neighbourhood of Manchester.

THE committee nominated by the Paris Academy of Sciences for the distribution of the Bonaparte fund (25,000 francs) for 1909 has received thirty-five applications, only nine of which are considered to conform with the regulations laid down by the committee of 1908. It is proposed to allocate the fund as follows:—4000 francs to M. Cayeux, to enable him to pursue his researches on the fossils of the Oolitic iron deposits in the United States; 4000 francs to M. Chevalier, to assist him in carrying on his geographical and ethnographical researches in the French colonies in tropical Africa; 4000 francs to M. Pérez, to assist in the publication of his memoir entitled "Recherches histologiques sur les Métamorphoses des Muscides"; 3000 francs to M. Houard, to enable him to proceed to Corsica, Algeria, and Tunis to collect material for his anatomical and physiological studies; 2000 francs to M. Berget, for the construction of an apparatus for the study of the distribution and intensity of gravity; 2000 francs to M. Bernard, to continue his studies of the variation of the solar radiation and the illumination of the sky in the immediate neighbourhood of the sun; 2000 francs to M. Blaringhem, for the continuation of his experimental researches on the variation of species; 2000 francs to M. Estanave, for the continuation of his researches on stereoscopic projection by direct vision, stereoradiography, and autostereoscopy; 2000 francs to M. Mathias, to enable him to continue in the cryogenic laboratory of Leyden his re-

searches on liquids and on the law of corresponding states at low temperatures.

THE seventh annual meeting of the South African Association for the Advancement of Science will be held at Bloemfontein during the week ending on Saturday, October 2, under the presidency of Sir H. Goold Adams, K.C.M.G. The work of the association will be divided into three sections, as follows:—section i. will include mathematics, physics, astronomy, meteorology, geodesy, geography, engineering, mining, and architecture; section ii. will include chemistry, metallurgy, mineralogy, geology, botany, zoology, agriculture, forestry, bacteriology, physiology, and hygiene; section iii. will include education, philology, psychology, history, archæology, economics, statistics, sociology, anthropology, and ethnology. Papers on any of the subjects enumerated will be welcomed, and should be submitted to either of the secretaries. A strong reception committee has been formed under the chairmanship of the Mayor of Bloemfontein (Mr. C. L. Botha), who is taking active steps towards making the visit to Bloemfontein a success. The joint honorary secretaries at Bloemfontein are Dr. Geo. Potts, of the Grey University College, and Mr. Arthur Stead, 40 Victoria Road, Bloemfontein. Further details regarding this meeting of the association may be obtained from the assistant general secretary, P.O. Box 1497, Cape Town.

THE provisional programme of Section H (Anthropology) of the British Association, for the Winnipeg meeting, has now reached us. In arranging the proceedings of the section an attempt has been made, so far as possible, to cover the latest developments in anthropological science. Dr. T. Ashby, director of the British School at Rome, will deal with archæology in the western Mediterranean; Mr. R. M. Dawkins, director of the British School at Athens, with archæology in the eastern Mediterranean; and Mr. D. G. Hogarth with the archæology of Asia Minor, with special reference to the Hittites. Miss Breton will review the present state of our knowledge of the arms and armour and of the physical type of the ancient inhabitants of Central America. It is hoped that the first results of an expedition which Dr. Haddon is now conducting among the natives of the western coast of North America may be available for the meeting. A number of prominent anthropologists of the United States have promised to contribute to the proceedings of the section. Among these may be mentioned Dr. F. Boas, who will deal with anthropological problems in Canada; Miss Fletcher, who will read a paper on her work among the Omaha people; papers will also be contributed by Dr. Gordon, of Pennsylvania, and Dr. Clarence Moore. Dr. Harry Piers, of Halifax, Nova Scotia, will deal with our present knowledge of the natives of Nova Scotia, and Mr. C. Hill-Tout will present his final report on the natives of British Columbia. The valuable reports which have been presented to the association from year to year by Mr. Hill-Tout are the results of work undertaken under the auspices of the Canadian Ethnographic Survey Committee of the British Association, now defunct. In this connection it may be mentioned that papers dealing with the urgent necessity for an ethnographic survey of Canada will be contributed by Mr. E. S. Hartland and Dr. F. C. Shrubbsall.

In the *Revue scientifique* for July 3 is published the discourse delivered by Dr. Edmond Perrier, Director of the Paris National Museum of Natural History, on the occasion of the inauguration, on June 13, of the statue of Jean de Lamarck. In this oration, which is characterised by eloquence and insight, M. Perrier does full justice to the

extraordinary industry of Lamarck, and to the merits of his work on the systematics of invertebrates and plants. In dealing with his speculative treatises on meteorology and kindred subjects, while allowing that his imagination was apt to get the better of his judgment, M. Perrier pertinently asks what would become of science if its professors never permitted themselves to attack questions which current opinion pronounces insoluble. On the subject of organic evolution, the author brings out in an interesting way the contrast between the influence of Lamarck and that of Darwin upon scientific opinion. M. Perrier does not concern himself to defend Lamarck's view of the method of evolution against objections, but points out that while Lamarck was himself thoroughly convinced of the truth of the general principle which is everywhere accepted to-day, his work met at the time with almost universal neglect. On the other hand, it fell to Darwin's lot to secure the general assent of his scientific contemporaries. After discussing the opposition to Lamarck offered by Cuvier, M. Perrier concludes with the observation that the great anatomist, in the pride of his assurance, was after all mistaken, and once more it is the *pêcheur de Lune* who was right.

THE Torquay Natural History Society has started a journal of its own, of the first number of which we have received a copy. This opens with an account of the history of the society, which is followed by a series of short papers, several of them dealing with local subjects.

WE are indebted to the Conchological Society for a copy of the July number of the *Journal of Conchology*, in which special reference is made to the need of further workers in Scotland to assist the "census" of British land and fresh-water molluscs now being taken.

THE July number of the *Popular Science Monthly* contains two articles on Darwinian subjects, one, by Prof. F. H. Giddings, dealing with Darwinism in the theory of social evolution, while in the second Prof. Dewey discusses Darwin's influence on philosophy.

THE July number of the *Museums Journal* deals largely with American topics, one article being devoted to the tariff on certain objects of art, a second to exhibits in the Brooklyn Institute illustrative of evolution and the preservation of animals, and a third to the history and collections of the Chicago Academy of Sciences.

To vol. xxvi. (pp. 283–331) of the *Bulletin of the American Museum of Natural History*, Mr. A. Hermann, the chief preparator to the museum, contributes an interesting account of the methods now in use in preparing vertebrate fossils. The plates accompanying this paper illustrate the newest American systems of mounting fossil skeletons for the combined purposes of exhibition and study.

DR. G. STEINMANN has sent us a copy of a paper entitled "Zur Abstammung der Säuger," published in vol. ii. of the *Zeitschrift für induktive Abstammungs- und Vererbungslehre*, in which he further elaborates his remarkable views as to the polyphyletic origin of mammals. The extent to which he carries his views will be apparent when we state that while he derives Glyptodon from the dinosaurs of the Ancylosaurus group, its relative Panochthus is considered to be descended from Polacanthus.

ACCORDING to the July number of the *Selborne Magazine*, the Brent Valley Bird-sanctuary is yearly proving more and more successful, nightingales being numerous, while nuthatches and nightjars have made their appearance in the preserve. At least one pair of nuthatches is known to

have nested, and it is not improbable that the nightjars may have laid in a recently made clearing. The Selborne Society desires to make it known that its work is by no means limited to birds, but that antiquities, as well as many other subjects, come within its purview.

THE New York Zoological Society has recently issued a special "Wild-Life Preservation Number," dealing with the efforts that have been recently made, alike in the States and in British Columbia, to preserve a remnant of the big-game fauna of the country. The year under review is a notable one, on account of marking the establishment of no fewer than five new game-reserves on the North American continent. By special enactment, the prongbuck, of which it is estimated that above 5000 head still remain, has been placed on the totally protected list; but it is a question whether the law will be obeyed in remote districts. If not, the only course is to form a reserve in the special habitat of this remarkable and interesting species.

It is surprising how long it takes to acquire a complete knowledge of the structure even of an animal so thoroughly investigated as the frog. It is not many months since the existence of Reissner's fibre in the *canalis centralis* of the central nervous system of this animal was first announced by Nicholls, and now we learn that the frog also possesses a *nervus terminalis*, morphologically similar to that of fishes. For this information we are indebted to Herrick, who contributes a short paper on the subject to the May number of the *Journal of Comparative Neurology and Psychology*. The nerves in question, for they are, of course, paired, are extremely short and slender, and may be observed in transverse sections lying beneath the olfactory bulbs, but they appear to be quite distinct from the olfactory nerves. They are composed of non-medullated fibres. In the next paper in the same journal, R. E. Sheldon records the occurrence of the same pair of nerves in the carp.

STUDENTS of embryology will find much to interest them in two recent numbers of the *Zeitschrift für wissenschaftliche Zoologie* (vol. xcii., parts iii. and iv.). A memoir by Erwin Taube on the development of the Euphausiidae deals with the segmentation of the egg up to the time of gastrulation, and constitutes an important contribution to our knowledge of cell-lineage in the earlier stages of ontogeny. A kindred topic is ably handled by E. Martini in a study on the constancy of the histological elements in *Oikopleura longicauda*. The author maintains that in many species certain cell-individuals in every specimen come to occupy exactly the same position in the body, always show the same relations to their surroundings, and can also be recognised as homologous by their histological characters. He refers to Goldschmidt's recent work on the central nervous system of *Ascaris* as one of the best examples of such constancy, and finds a similar condition of things in the nervous system, notochord, and certain other organs of *Oikopleura*, while the endostyle does not conform to the general rule.

In the May number of the *Journal of Experimental Zoology*, Raymond Pearl sketches out a comprehensive scheme for the study of the physiology of reproduction in the domestic fowl, and makes a commencement with a biometrical investigation of the shape of the eggs laid by a particular pullet. The first egg was very abnormal in shape, but the normal form was ultimately attained by a progressive regulatory change which is shown to follow a logarithmic curve. The author concludes that the shape of the egg is determined by the muscular activity of the

walls of the uterus. The physiology of nematocysts is dealt with in the same journal by O. C. Glaser and C. M. Sparrow, whose investigations support Grosvenor's view that the discharge of the thread-cells is brought about by osmotic pressure. They also afford further proof of the fact, recently demonstrated by Toppe, that the threads are capable of penetrating the tissues of other animals; but it appears that in order to do this they must make their punctures before eversion is complete.

WE learn from the *Transvaal Agricultural Journal* (No. 27) that *Phylloxera vastatrix* has appeared in the Transvaal vineyards, and may be expected to spread and do a considerable amount of damage. Fortunately the Transvaal possesses an excellent Agricultural Department, and all proper steps to cope with the pest will be taken. In an article in the journal Mr. Davis, the Government horticulturist, describes phylloxera-resistant vines that would be suitable for the country and should in future be planted.

THE *Agricultural Journal* of the Cape of Good Hope recently directed attention to the ravages caused by the *Antheraea tyrrhea* caterpillar in certain districts, and published an appeal from the Government entomologist, Mr. Lounsbury, for material. The caterpillar comes as a plague, but between its intervals of abundance it appears to be held in check by some parasitic enemy. Two parasites are known, and others are being looked for as the simplest and most effective way of getting rid of the caterpillar.

THE necessity for looking after fruit trees properly is well brought out in a Bulletin (No. 253) recently issued by the Michigan State Agricultural College. Upon many Michigan farms there are said to be mature apple orchards that have been neglected for many years, and have produced no income beyond an occasional small crop of apples of uncertain quality. A detailed account is given of the methods, chiefly involving pruning and spraying, by which three such orchards were improved and made to yield an average net profit of 104 dollars per acre per annum for a period of five years.

THE results of field experiments in Shropshire and Staffordshire, and at the Harper Adams Agricultural College, have just been issued by the Staffordshire Education Committee. They include manurial trials on grass land, potatoes, mangolds, and swedes, and are on the lines generally adopted in such cases. Unfortunately, no analyses of the soils are given, nor any descriptions sufficient to enable anyone to apply the results to any other case. However, if the intention was simply to show that artificial manures increase crops the experiments have been a success. The experiments carried out at the college are fuller, and some interesting notes are added from the various departments on black scab of potatoes, by Mr. Malthouse; black leg in cattle, by Mr. Wilson; and agricultural chemical analyses, by Mr. B. F. Davies.

It has always been recognised in England that an agricultural college should have its own farm, but in Scotland the conditions have hitherto been rather different, and it has been held that the college could do without one. We now learn, however, from the *North British Agriculturist*, that the Glasgow College of Agriculture has decided to acquire a farm at Kilmarnock, to be used both for teaching and experimental purposes. The sum of 3000l. will be needed for equipment, but the Scotch Education Department has promised to contribute one half, on condition that the other half can be raised locally. The experiment is attracting a good deal of attention among agriculturists in Scotland.

EXPERIMENTS made in Cape Colony, and reported in the *Agricultural Journal* of the Cape of Good Hope, show that Turkish tobacco of good quality can be grown in certain districts. Irrigation was not found necessary, excepting when planting was to give the crop a good start; indeed, the crop will stand drought quite as well as vines when once it is established. The price realised in 1907 was 1s. 11d. per lb., being 5d. in excess of the previous year's price; nearly three times as much was grown in 1908 as in 1907, and there has also been a great improvement made in the method of curing. Although the labour required is somewhat special, it has not been found impracticable to train women, girls, and boys to do the finer work.

THE removal of charlock from corn crops was formerly a costly matter when it had to be effected by hoeing, but has become much more simple since chemical methods were devised. Experiments carried on at various centres are reported by Mr. G. F. Strawson, and confirm the results obtained by other investigators. They show that young charlock can be destroyed in growing corn crops without injury to the latter by spraying with fifty gallons of a 3 per cent. solution of copper sulphate per acre. If the charlock is older a stronger solution must be used; early spraying is therefore economical. The crop—whether corn, tares, beans, or peas—increases considerably when the competing weeds are killed, and young grass seeds and clover sown in with the corn are not injured by the copper sulphate because their leaves are too smooth for the solution to remain on.

A WELL-ILLUSTRATED description of the Polish Miocene species of *Turritella* is given by M. W. Friedberg in the *Bulletin international* of the Cracow Academy, 1909, 2. The author finds that the genus is well represented, and contains a number of varietal forms differing from those ordinarily described. This applies specially to *T. Turris* and *T. pythagoria*, of each of which M. Friedberg describes five varieties.

THE probable origin of the white Florentine iris forms the subject of a note by Drs. R. Pirotta and M. Puglisi in the *Atti dei Lincei*, xviii., 10. Forms have been observed with blue spots variously arranged, and it is found that these are not peculiar to individual plants, but may occur on different plants in different years. From this, as well as from geographical considerations, the authors propound the view that *Iris florentina* is a variety of *I. pallida* which has become permanent.

By the publication of a well-arranged catalogue, the authorities of the Bradford Public Libraries have shown in the most practical way their appreciation of a large collection of scientific books and pamphlets acquired from the library of the late Dr. F. A. Lees, the author of the "Flora of West Yorkshire." The collection is especially rich in local floras of the British Isles. The herbarium of 25,000 specimens collected by Dr. Lees was acquired at the same time, and is arranged in the Cartwright Memorial Hall.

AN account of the black wax of Burma known in the vernacular as "pwè-nyet" is provided by Mr. D. Hooper in the *Agricultural Ledger* (No. iii., 1908). The wax is stored by a small bee, *Melipona laeviceps*, which forms its hive generally in a hollow tree, and constructs a peculiar trumpet-shaped entrance. The bees commonly swarm in the kanyin-tree, *Dipterocarpus turbinatus*, because in tapping for resin large holes are made in the trees which furnish suitable cavities for the construction of the hives. Incidentally, Mr. Hooper publishes analyses of resins from various species of *Hopea*, *Shorea*, *Dipterocarpus*, and *Cana-*

rium for comparison with the wax. The chemical tests point to the wax being similar to the resins of *Dipterocarpus* and *Hopea*, while the substance forming the vestibule is almost certainly the resin of *Dipterocarpus*.

A FOURTH article on the sylva of Colorado dealing with forest formations and forest trees is contributed by Prof. F. Ramaley to vol. vi., No. 3, of the *University of Colorado studies*. There is a well-differentiated forest region in the river valleys, where cotton woods and willows predominate; two mesophytic formations are the canyon and aspen forests of the foothills; the higher montane and sub-alpine formations are composed of pines, firs, and Douglas spruce. The flora contains a number of interesting trees. The pinyon, *Pinus edulis*, yields large edible seeds; the rock pine, *P. scopulorum*, is recommended for planting in semi-arid districts; the Colorado blue spruce, *Picea parryana*, is a fine ornamental tree. The genus *Populus* includes the aspen, the balsam poplar, broad-leaf cotton-wood, *P. Sargentii*, narrow-leaf cotton-wood, *P. angustifolia*, and lance-leaf cotton-wood, *P. acuminata*. *Rhamnus purshiana* furnishes the drug "cascara sagrada."

THERE are differences of opinion as to the best method of improving the Indian cottons, but there can be no doubt as to the advisability of testing the possibilities of improvement by the hybridisation of native varieties. The problem, which furnishes a capital opportunity for disciples of the Mendelian school, has been broached by Mr. P. F. Fyson, who records his experiments in the *Memoirs of the Department of Agriculture in India* (vol. ii. No. 6). His object was to test the stability of certain characters as a preliminary to more definite investigations. Colour of flower, shape of leaf, and fuzziness of seed were selected as likely characters. With regard to colour, yellow appeared to be dominant over white, and since the colour in *Gossypium* is a sap colour, this conforms to general experience. The pointed leaf characteristic of *Gossypium neglectum* (*arboreum*) was dominant over rounded *herbaceum*, but the segregation of "fuzzy" and "naked" seeds was not distinct.

In the July number of the *Reliquary*, Mr. E. H. Goddard continues the useful series of articles dealing with local collections of antiquities, his subject being Roman objects discovered in Wiltshire. Though the county possesses no Roman sites ranking in interest and importance with those of Dorchester, Silchester, Bath, or even Lydney or Woodchester, it contains Cunetio near Marlborough, villas at Box, Colerne, and Wraxall, and, in particular, Old Sarum, which will remain a sealed book until the excavations now projected are taken in hand. But besides these there are numerous smaller sites, of which only one, Rotherley, has been properly investigated. The best collection of late-Celtic pottery is that gained from the Westbury Ironworks. Mr. Goddard figures and describes a number of interesting objects—pottery, bronze rings and fibulae, kitchen utensils, the sole of a Roman lady's shoe, and a curious bronze plaque with a figure of Minerva, the last from the downs above Lavington. On October 21, 1638, the Devil visited Widdecombe Church, a fine building on the river Webburn, in Dartmoor, a full account of which remarkable event is recorded on a tablet in curious versification, the work of the village schoolmaster, which is preserved in the church. As a matter of fact, the place was the scene of a terrible thunderstorm, which caused the loss of several lives, damaged the tower, and caused such consternation that it was attributed to demoniacal agency. The original tablet, a curious instance of the popular beliefs current at the time, is reproduced by Mr. Le Blanc Smith in the July number of the *Reliquary*.

THE seventh annual report of the director of the Bureau of Science, Manila, shows what the Americans are accomplishing in the Philippines. One of the most pressing needs has been to obtain a sufficient medical staff to cope with the infectious and epidemic diseases and the pernicious superstitions of the natives relating thereto. At present there is but one doctor to every 430 square miles of territory in the Philippines, and many towns even of some importance have no resident medical man. In these circumstances the medical school is training intelligent natives, and is making efforts to secure sufficient numbers of students to remedy the deficiency. Anthropomorphic measurements of Filipinos and of Igorots are made, and other studies have been undertaken to throw light on the histories of the natives. In addition, a large amount of work is recorded on the natural resources of the island—sugar, fibres, essential oils, &c. It is stated that the fruit of *Pittosporum resiniferum*, Hemsl., commonly known as the petroleum nut, yielded on distillation 7 per cent. of heptane.

"A SHORT Guide to the Museum of Practical Geology, Jermyn Street, London, S.W.," has been issued anonymously at the price of one penny. It seems strange that the names of the curator and director are not attached, but we may take it for granted that they are responsible, as the guide is "sold only at the museum." It will undoubtedly prove of great service to visitors in directing attention to the many objects of scientific interest and practical importance that are exhibited, and in giving so far as possible within the compass of forty-eight pages a good deal of explanatory information. The last handbook to the museum, prepared by Mr. Rudler, the former curator, was issued in 1896, and since that date many alterations and improvements have been made. The removal of the fine collection of British pottery and porcelain, though lamented by many students, was necessary for the proper display of further raw materials in place of manufactured articles. Thus the exhibition of British minerals has been considerably extended, and the practical applications of geology have been more fully illustrated by examples of brick clays, road stones, &c. The map department has received special attention, and illustrations are displayed of the mode of preparation of the Geological Survey sheets on the scales of six inches and one inch to a mile. Instructive models of the Isle of Purbeck and of the complicated district of Assynt, in Sutherlandshire, have also been introduced. Plans showing the arrangement of the specimens on the several floors of the museum form an exceedingly useful feature in this new guide.

WE have received from the Philippine Weather Bureau reports by the Rev. J. Coronas of two severe typhoons experienced in 1908. The first, called the Hong Kong typhoon of July 27 and 28, resembled in its leading characteristics the destructive storm of September 18, 1906. The Manila Observatory was able to announce its appearance to the north of Luzon on the morning of July 26; it increased in speed in the China Sea, where its velocity of translation was about $8\frac{1}{2}$ miles an hour, and about $14\frac{1}{2}$ miles when it struck Hong Kong, but once in China it began to fill up, as is generally the case. The Hong Kong Observatory carefully watched the progress of the storm, and gave timely warning of its approach. The second storm, called the *Tarlac* typhoon of September 18 to 27, from the wreck of the ship of that name, was first announced on the morning of September 20, being then near the Western Carolines. When it reached the Philippines its velocity was about fifteen miles an hour. The storm was most violent at Borongan (Samar), and reduced that town to a heap of

ruins; it reached the northern part of Indo-China on September 27. An eye-witness at Borongan states that the roof of the town church was "blown up like a huge kite," while the convent was "simply crushed down" soon afterwards, showing that there were ascending and descending currents on the same side of the centre, the winds being in both cases from the same direction. The area of destructive winds had an average radius of about fifty miles. The full reports, with diagrams, are published in the bulletins of the Weather Bureau.

WE have received a reprint of the article "London by Night," by Mr. H. Wild, which appeared in *Photography and Focus* in March last. It contains four very realistic reproductions of photographs of London streets taken at night by means of the illumination provided by the ordinary artificial lights. The photographs were taken on rapid quarter plates of several makes by means of a portrait lens (Dallmeyer's 2B) with an exposure of about half a second, and they will bear enlargement up to 15×12 inches. They open up a field in photography which was undreamt of a few years ago.

THE June number of *Le Radium* contains an article by M. Moulin on the most probable value of the atomic charge e of electricity according to the most trustworthy of the observations made up to the present time. The three methods which M. Moulin discusses are:—First, the condensation method adopted by Sir J. Thomson and his pupils, and by Profs. Millikan and Begeman in America; second, the direct measurement of the charge on the particle, by Prof. Rutherford and Dr. Geiger; and third, the calculation of the number N of molecules in a gram molecule, based on the measurements of the Brownian movements by Prof. Perrin. The first and third of these methods agree in giving for e the value 4.1×10^{-10} electrostatic units, while the second gives 4.6, a high result which M. Moulin attributes to the want of uniformity in the layer of radium C with which Messrs. Rutherford and Geiger worked. His final conclusion is that the most probable value of e is 4.1×10^{-10} electrostatic units, and of N 7×10^{23} .

It is well known that reaction steam turbines have a lower efficiency at the high-pressure end than at the low-pressure end. This is caused by the relatively small area of blades at the high-pressure end and the proportionally high percentage of clearance which permits of excessive leakage of steam round the blades. Published tests of a large marine turbine show an efficiency ratio of the high-pressure turbine of 55 per cent. at full power, as against 63 per cent. for the low-pressure turbine, in spite of the adoption of lower steam and blade speeds in the high-pressure turbine, thus securing a higher ratio of blade area to clearance area for the purpose of reducing leakage. In the Melms-Pfenninger turbine, illustrated in *Engineering* for July 9, a successful attempt is made to combine the advantages of the impulse type for the high-pressure end with the reaction type for the intermediate and low-pressure sections. An important feature of this turbine is the adoption of a drum construction for the impulse section, in which it differs from the wheel construction usual in turbines of the Curtis type. The remainder of the turbine is of the well-known Parsons type. The makers say that they have found it practicable to work with a clearance of but 10 mils. between the nearest points of the opposed fixed and moving surfaces.

THE steamer *Tortuguero*, which was launched from the shipbuilding yard of Messrs. Alexander Stephen and Sons, Ltd., at Linthouse, on the Clyde, on March 24, and sailed on April 22, represents the latest practice in the transport

of bananas from the West Indies. A full description of the vessel appears in the *Engineer* for July 9, from which we note that she is of 5000 tons gross, having insulated space of 220,000 cubic feet, the capacity of the fruit bins being 175,000 cubic feet. Granulated cork is used for the insulating material, the average thickness of the cork being from 7 inches to 8 inches, and the bins are so constructed that the bunches of fruit do not come into contact with metal surfaces during transit, all such being protected by wood gratings and battens, or by hemp-rope coverings. An elaborate arrangement of air passages enables cooled air to be supplied throughout the cargo, the cooling of the air being effected by a Hall's CO₂ refrigerating plant. An even temperature of 55° F. is maintained, and the fruit is inspected frequently so as to ensure its arrival at Manchester in proper condition for the market. In loading, the fruit is stored without covering of any kind, the lowest bunches are arranged with stems vertical, and the final layer placed horizontally, an arrangement which economises space and ensures freedom from damage.

A SECOND edition of Mr. Arturo Massenz's "*Lavorazione e Tempera degli Acciai*" has been published by Mr. Ulrico Hoepli, of Milan. The price of the volume is 2 lire.

SOLUTIONS of the exercises in their "*Modern Geometry*" have been prepared by Messrs. C. Godfrey and A. W. Siddons, and are published in volume form by the Cambridge University Press at 4s. net.

MESSRS. DAWBARN AND WARD, LTD., have published a fifth edition of the 1909 "*Photographic Annual*, incorporating the Figures, Facts, and Formulæ of Photography." This year-book is edited by Mr. H. Snowden Ward, and the present issue has been extended, largely rewritten, and revised to June, 1909.

MR. BERNARD QUARITCH has just issued a catalogue of books on natural history which he is offering for sale. Particulars are given of works on zoology, geology, palæontology, mineralogy, and botany. Among other interesting items we notice the original drawings of Hubner's European butterflies, an example of Jacquin's *Selectarum Stirpium Americanarum Historia*, and a few important herbals.

We have received in two volumes parts A, B, C, and D of the quarterly bulletin of the results for the year 1907-8 secured during the periodical cruises and in intermediate periods in connection with the Permanent International Council for the Exploration of the Sea. The parts in order deal with the temperature and salinity of the surface water; the temperature, salinity, density, &c., of sea water at different depths; the oxygen, nitrogen, and carbon dioxide dissolved in sea water; and plankton tables for August and November, 1907, and February and May, 1908. The first three parts have been prepared with the assistance of Mr. Martin Knudsen, and the last with the help of Mr. Harry M. Kyle. The volumes are published by Andr. Fred. Høst & Fils, of Copenhagen.

OUR ASTRONOMICAL COLUMN.

STATIONARY METEOR RADIANTS.—Since Mr. Denning announced the existence of stationary meteoric radiants in 1878, many observers have endeavoured to explain, and account for, them, hitherto without much success. The apparent radiant of a meteor depends almost as much on the true direction of the earth's motion as it does on the true motion of the meteor itself, therefore it seems almost impossible that these bodies should appear to stream from the same point of the heavens for months at a time. In an article appearing in No. 5, vol. xxix., of the *Astro-physical Journal* (June, p. 365), Prof. W. H. Pickering

shows, however, that this apparently puzzling phenomenon is only what is to be expected, arguing from our present knowledge of meteor-orbits. Briefly, he shows by diagrams and tables that the attracting force of the earth's mass is, at different times, capable of deflecting or accelerating the smaller bodies, so that the apparent change of the longitude of the radiant counterbalances the variation produced by the earth's motion; thus the radiant appears to be stationary, or nearly so. Prof. Pickering also produces arguments against the prevalent idea that meteors are generally of infinitesimal mass.

COMPARISON OF THE SPECTRA OF THE CENTRE AND EDGE OF THE SUN'S DISC.—Previous observations having indicated that in passing from the centre to the edge of the sun's disc the spectrum suffers modification, MM. Buisson and Fabry recently repeated the observation, using their interferometer method, in which each wave-length is examined independently of those of the other lines. Their observations, which are published in No. 26 of the *Comptes rendus*, confirm the earlier ones of Hale and Adams, and Halm.

The latter showed that the wave-length of a line in the spectrum at the limb was a little greater than when the centre of the disc was observed. From the study of fourteen lines in the region of λ 4400 MM. Buisson and Fabry find that the increase of wave-length varies from 0.004 to 0.006 Ångström; to this rule the two vanadium lines, λ 4379.4 and λ 4406.8, are exceptions. The observations also show that in the spectrum at the limb the same lines are a little broader than in the spectrum at the centre, the increase of breadth amounting, in the mean, to 0.010 Ångström.

MM. Buisson and Fabry suggest that these two phenomena, displacement and broadening, are due to the same cause. The only modification a line really undergoes is a displacement, amounting to 0.010 Ångström, of its red edge, the more refrangible edge remaining invariable. In the exceptional case of vanadium the broadening is apparently symmetrical. They suggest, further, that the asymmetrical broadening may be caused by pressure—an increase of seven atmospheres would be sufficient to produce the observed effect—but only becomes apparent at the limb where a greater thickness of the denser layers is traversed by the radiations.

CHANGES OF FORM IN SUN-SPOTS.—Some interesting results of detailed observations of sun-spot forms are discussed, and illustrated by drawings, by M. A. Amaftounsky in No. 4332 of the *Astronomische Nachrichten*.

He shows that whilst, in general, the outline of the penumbra roughly follows the form of the nucleus, tremendous changes may take place in the former, whilst the latter is apparently undisturbed. This is what would be expected on the hypothesis that the nucleus of the spot is a depression, a hole, and the penumbra is produced by the ascending and descending of incandescent vapours. The appearance of bright spots in the nucleus, sometimes followed by the bridging and disintegration of the latter, is explained by the supposition that the nucleus is at a higher temperature than the photosphere, and constantly re-vaporises the filaments and tongues of the penumbra by the expulsion of hotter vapours.

MUTUAL OCCULTATION OF JUPITER'S SECOND AND FOURTH SATELLITES.—In No. 4338 of the *Astronomische Nachrichten* M. Pidoux describes the conjunction and mutual occultation of Jii. and Jiv. observed by him at the Geneva Observatory on June 17, 1908. Plotting the various measures, he finds that the conjunction took place at 8h. 33.4m. (G.M.T.), the shortest distance between the centres of the satellites being 1.9". Whilst the latter quantity agrees exactly with that calculated and published by Oudemans, the time is 4.6 minutes in advance of the ephemeris.

According to calculation, satellites iii. and iv. should have been in conjunction at 7h. 58.5m. on July 3, 1908, but when first observed by M. Pidoux, at 7h. 52m., the conjunction was already complete and the satellites appeared as one. At 7h. 59m. the system was elongated, and at 8h. 2m. the two images were distinctly separated. It therefore appears that the observations prove the calculated times to be several minutes too late.